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Fall 2019

# PHIL 334-107: Engineering Ethics

Peter Heap

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# Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering

## SYLLABUS

### Course Information

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Course: Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering

Number/section: PHIL 334 – 107

Semester: Fall 2019

Time: Wednesday, 6 p.m. to 8:50 p.m.

Location: Kupfrian 117

Instructor: Peter Heap

Email: pah5@njit.edu

Office hours: I'm available before and after class. Email me if you want to set an appointment

### Description

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Ethics is an integral part of the practice of engineering. Many, if not all, engineering tasks have an ethical component and incorporate a philosophical outlook. Although some engineering problems have a stronger ethical flavor while others are more weighted to the technical side, there is no clear dividing line between what is an ethical question and what is an engineering question. The problems are, indeed, similar in nature: engineers, ethicists and engineers thinking ethically must all work with incomplete information. They produce their best answers, not “right” answers, and their solutions are dependent on the context of the problem. The traditional view that engineering problems are purely technical and that ethics is someone else’s job is flawed. To engineer without ethics and without a philosophical understanding is to engineer badly.

This purpose of this class is to show how engineering is inseparable from ethics and philosophy. Students will:

- Discover how ethical and philosophical questions pervade engineering;
- Learn how to uncover the ethical and philosophical issues contained in engineering tasks;
- Think about the way in which engineering choices express ethical and philosophical standpoints;
- Improve their ability to analyze ethical problems in engineering; and
- Examine the ethical duties of engineers in the practice of their profession.

The course will emphasize case studies of particular examples in engineering. Rather than dictating ethical positions to students, it aims to equip them with the tools and abilities to think through engineering problems from an ethical perspective.

## Books

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You will need to buy the following books:

- Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, fourth edition, McGraw-Hill, 2005. ISBN 978-0-07-283115-3.
- Langdon Winner, *The Whale and The Reactor*, University of Chicago Press, 1989. ISBN 978-0-226-90211-0.

Other readings will be available via URLs, from the NJIT library website or by email.

## Grading

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Grading will be as follows:

- Class participation and attendance: 14%
- Forms of life case study: 11%
- First ethics case study: 11%
- Final ethics case study: 21%
- Mid-term exam: 12%
- Final exam: 31%

### Class participation and attendance

Discussion is an important part of improving our understanding, clarifying our ideas and discovering different points of view. It also helps develop the valuable skill of being able to explain and defend a point of view. Debate will be encouraged in this course. The grade is 1% per week for every week except the final exam week, divided between attendance and participation. Total: 14% of grade.

### Forms of life case study

The first case study will analyze a product or technology using the perspective of forms of life. It will have two parts, the identification of a case and sources, worth 1%, and description and analysis, worth 10%. Total: 11% of grade. For this assignment **only** you may revise and resubmit your work for a higher grade.

### First ethics case study

The second case study will have two parts. Identification of a case and sources, worth 1%, and description and analysis using theories discussed in class, worth 10%. Total: 11% of grade.

### Final ethics case study

The third case study will have two parts. Identification of a case and sources, worth 1%, and description and analysis using theories discussed in class, worth 20%. Total: 21% of grade.

## Mid-term exam

The mid-term exam will be made up of four short essay questions worth 3% per question. You will have a choice of questions. Total: 12% of grade.

## Final exam

The final exam will be made up of three short essay questions worth 3% per question, six multiple-choice questions worth 1% each and two longer essay questions worth 8% per question. You will have a choice of questions. The exam will cover the entire semester. Total: 31% of grade.

## Grades

The maximum grade for the class is 100%. Letter grades will be assigned as follows:

90 to 100:	A	70 to 74:	C
85 to 89:	B+	60 to 69:	D
80 to 84:	B	59 and less:	F
75 to 79:	C+		

## Deadlines

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Work is due on the dates shown in the class schedule. Grades for late submissions will be reduced by one level for up to a week late (e.g. B+ to B) and two levels (e.g. B+ to C+) for more than a week late.

## Plagiarism and Academic Integrity

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Plagiarism or copying of any kind will not be tolerated. All work must be your own. Specifically, it must be your own thoughts and your own ideas expressed in your own words. Any use of other's efforts must be credited via a citation. NJIT's policy is as follows:

Academic integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students' office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will be subject to disciplinary action. This may include a failing grade of F and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu)

# Class Schedule

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## September 4

**Introduction:** Plan of the course, introduction to ethics and to ethics in engineering

## September 11

**Models of engineering:** Engineering as commitment, engineers as professionals, engineering as responsibility

**Professional ideals and business demands:** Engineers' two roles, the purpose of a corporation, the Revolt of the Engineers

**Ethical theories:** Deontological ethics, utilitarianism, virtue ethics and more

Mike W. Martin and Roland Schinzinger, "Ethics and Professionalism," in *Ethics in Engineering*, 1-31.

## September 18

**Case studies:** Northern States Power, San Diego water purification

**Two more models of engineering:** Engineering as experimentation, engineering as pragmatic participation

**Case studies:** Samsung Galaxy Note 7, Teton Dam, the electricity grid

### Introduction to forms of life

Mike W. Martin and Roland Schinzinger, "Engineering as Social Experimentation," in *Ethics in Engineering*, sections 4.1 and 4.2, 88-106

Anna Shedletsky, "Aggressive Design Caused Samsung Galaxy Note 7 battery explosions," Instrumental, Inc., Dec. 1, 2016. <https://www.instrumental.com/blog/2016/12/1/aggressive-design-caused-samsung-galaxy-note-7-battery-explosions>

Philip M. Boffey, "Teton Dam Verdict: A Foul-up by the Engineers," *Science*, Vol. 195, No. 4275, Jan. 21, 1977, 270-272 (Available from NJIT library website)

Olive Heffernan, "Bottoms Up," *Scientific American*, July 2014, 69-75.  
<http://www.oliveheffernan.com/wp-content/uploads/2015/01/Bottoms-Up-July-2014.pdf>

Peter Fairley, "Building a Weather-Smart Grid," *Scientific American*, July 2018, 60-65.  
[https://www.researchgate.net/publication/325891548\\_Building\\_a\\_Weather-Smart\\_Grid](https://www.researchgate.net/publication/325891548_Building_a_Weather-Smart_Grid)

## September 25

**Case study:** Challenger disaster

**Forms of life, political technology**

**Case study:** Cellphones, social media

Mike W. Martin and Roland Schinzinger, "Challenger," in *Ethics in Engineering*, 106-116.

Langdon Winner, "Technologies as Forms of Life," "Do Artifacts Have Politics?" in *The Whale and the Reactor*, 3-39.

David Streitfeld, "Tech Giants, Once Seen as Saviors, Are Now Viewed as Threats," *New York Times*, Oct. 13, 2017, A1. <https://nyti.ms/2Z4i2au>

Kevin Roose, "And for His Next Act, Ev Williams Will Fix the Internet," *New York Times*, May 9, 2018, B1. <https://www.nytimes.com/2018/05/09/business/ev-williams-twitter-medium.html> or <https://nyti.ms/2I1qmk4>

## October 2

**Perceptions, safety, risk:** How technology changes perceptions, how we perceive technology, risks versus hazards

**Case studies:** Flight 956, Chernobyl and Three Mile Island

John Edward Huth, "Losing Our Way in the World," *New York Times*, July 21, 2013.  
<https://www.nytimes.com/2013/07/21/opinion/sunday/losing-our-way-in-the-world.html>

Stephen Manes, "When Trust in 'Data' is Misplaced," *New York Times*, Sept. 17, 1996.  
<https://www.nytimes.com/1996/09/17/science/when-trust-in-data-is-misplaced.html>

Federal Aviation Administration, American Airlines Flight 965 near Cali: Accident Overview.  
[https://lessonslearned.faa.gov/ll\\_main.cfm?TabID=1&LLID=43&LLTypeID=2](https://lessonslearned.faa.gov/ll_main.cfm?TabID=1&LLID=43&LLTypeID=2)

Mike W. Martin and Roland Schinzinger, "Commitment to Safety," in *Ethics in Engineering*, 117-145.

Langdon Winner, "On Not Hitting the Tar-Baby," in *The Whale and the Reactor*, 138-154.

- Forms of life case study: Identify a case

## October 9

**Moral reasoning:** A five-step process

**Case study:** The Ford Pinto

Mike W. Martin and Roland Schinzinger, "Resolving Ethical Dilemmas" in *Ethics in Engineering*, 32-39

Mark Dowie, "Pinto Madness," *Mother Jones*, September/October 1977.  
<http://www.motherjones.com/politics/1977/09/pinto-madness>

## October 16

### Review for mid-term exam

**Cost-benefit analysis and utilitarianism:** Working for a tobacco company, criticisms and responses

Steven Kelman, "Cost-Benefit Analysis: An Ethical Critique," *The American*, Feb. 7, 1981.

<http://www.aei.org/publication/cost-benefit-analysis-an-ethical-critique/>

James V. DeLong, Robert M. Solow, Gerard Butters, John E. Calfee, Pauline Ippolito and Robert A.

Nisbet, "Defending Cost-Benefit Analysis: Replies to Steven Kelman," *The American*, April 11,

1981. <http://www.aei.org/publication/defending-cost-benefit-analysis-replies-to-steven-kelman/>

- Forms of life case study: Analysis due

## October 23

### Midterm exam

#### Technological revolutions

Langdon Winner, "Mythinformation," in *The Whale and the Reactor*, 98-117 (If you are short of time: 106-115).

Optional: Langdon Winner, "Building the Better Mousetrap" and "The Whale and the Reactor," in *The Whale and the Reactor*, 61-84, 164-178 (These chapters will be discussed briefly but you are not expected to read them).

Nolen Gertz, *Death by Robot*, ABC, July 12, 2016.

<http://www.abc.net.au/religion/articles/2016/07/12/4499213.htm>

Atlas, the Next Generation. <https://youtu.be/rVlhMGQgDkY>

Otto and Budweiser: *First Shipment by Self-Driving Truck*.

<https://www.youtube.com/watch?v=QboKzb3haK8>

Matthew Hutson, "Can You be Friends with Your Coffee Maker?" *The Atlantic*, December 2017.

<https://www.theatlantic.com/magazine/archive/2017/12/love-objects/544143/>

## October 30

**Whistleblowing:** The ethical dilemma, when is it permissible, when is it required?

Dennis A. Gioia, "Pinto Fires and Personal Ethics: A Script Analysis of Missed Opportunities," *Journal of Business Ethics*, 1992, Vol. 11 (5), 379-389. (To be distributed)

Mike W. Martin and Roland Schinzinger, "Whistleblowing," in *Ethics in Engineering*, 172-184.

Jerry Useem, "What Was Volkswagen Thinking?" *The Atlantic*, January/February 2016, 26-28. (Available from NJIT library website)

- Forms of life case study: Resubmissions due
- First ethics case study: Identify a case

## November 6

### Codes of ethics

**Ethical relativism:** Are ethical values the same everywhere and for everyone?

### International business and offshoring

**Case study:** Bhopal

**Case study:** Tesla

Mike W. Martin and Roland Schinzinger, "Codes of Ethics," in *Ethics in Engineering*, 44-53.

Mike W. Martin and Roland Schinzinger, "Multinational Corporations," in *Ethics in Engineering*, Sections 9.1.2, 9.1.3, 9.1.4 and 9.1.5, 245-252.

Cherri Pancake, "Programmers need ethics when designing the technologies that influence people's lives," *The Conversation*, Aug. 8, 2019. <https://theconversation.com/programmers-need-ethics-when-designing-the-technologies-that-influence-peoples-lives-100802>

Matt Richtel, "Tesla's Chief Sticks to Mission Despite Setbacks," *New York Times*, July 24, 2016. <http://nyti.ms/2akqWaY>

Eric A. Taub, "Can Tesla's Autopilot be Trusted? Not Always," *New York Times*, Sept. 23, 2016. <http://nyti.ms/2d6WthQ>

Jack Stewart, "Even Elon Musk Abuses Tesla's Autopilot." *Wired*, Dec. 10, 2018. <https://www.wired.com/story/elon-musk-tesla-autopilot-60-minutes-interview/>

Neil E. Boudette, "Big Carmakers Merge, Cautiously, Into the Self-Driving Lane," *New York Times*, Sept. 1, 2016. <http://nyti.ms/2c4RwWz>

Robert Yaeger, "When Cars do the Driving, Who Will Feel The Joy?" *New York Times*, June 14, 2018. <https://nyti.ms/2l8SVy1> or <https://www.nytimes.com/2018/06/14/business/autonomous-cars-enthusiasts.html>

## November 13

### Autonomous systems

Paul Scharre, "Autonomous Weapons and Operational Risk," *Center for a New American Security*, 1-40, (41-54 is optional). <https://www.cnas.org/publications/reports/autonomous-weapons-and-operational-risk>

Arend Hintze, "What an Artificial Intelligence Researcher Fears about AI," *The Conversation*, July 13, 2017. <https://theconversation.com/what-an-artificial-intelligence-researcher-fears-about-ai-78655>

Christopher Salge, "Asimov's Laws Won't Stop Robots Harming Humans So We've Developed a Better Solution," *The Conversation*, July 10, 2017. <https://theconversation.com/asimovs-laws-wont-stop-robots-harming-humans-so-weve-developed-a-better-solution-80569>

- First ethics case study: Analysis due



## November 20

**Engineering and the environment:** Attitudes to nature, the Invisible Hand, the Tragedy of the Commons, externalities, theories of environmental responsibility

**Case study:** Southern Co.'s clean coal project

Langdon Winner, "The State of Nature Revisited" in *The Whale and the Reactor*, 121-137

Mike W. Martin and Roland Schinzinger, "Environmental Ethics," in *Ethics in Engineering*, 219-241.

Ian Urbina, "Piles of Dirty Secrets Behind a Model 'Clean Coal' Project," *New York Times*, July 5, 2016.  
<http://nyti.ms/29sl3JH/> or <https://www.nytimes.com/2016/07/05/science/kemper-coal-mississippi.html>

- Final ethics case study: Identify a case

## November 27

**No class**

## December 4

**Professionalism, responsibility, honesty, codes of conduct**

Mike W. Martin and Roland Schinzinger, "Workplace Responsibilities and Rights" and "Honesty," in *Ethics in Engineering*, sections 6.1 to 6.3, 146-172, chapter 7, 189-218.

- Final ethics case study: Analysis due

## December 11

**Review for final exam**

**Weapons:** Just war theory, examples

**Personal fulfillment, personal values**

Mike W. Martin and Roland Schinzinger, "Weapons Development," in *Ethics in Engineering*, 266-271.

Mike W. Martin and Roland Schinzinger, "Self-Realization and Self-Interest," in *Ethics in Engineering*, 72-84

## December 18

**Final exam**